

# **Safe T Net 210**

## **Instruction Manual**

Part Number 71-0012

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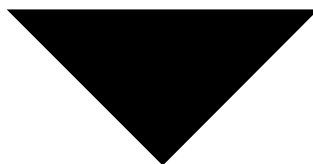
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## NOTATION CONVENTIONS

Notices are used in this operator's manual to alert you to hazardous conditions to person or instrument and to notify you of additional information. This operator's manual uses the following notices.



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### **WARNING**

Notifies you of potential danger that can result in personal injury or death.

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### **CAUTION**

Notifies you of potential damage to equipment.

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### **NOTE**

Notifies you of additional or critical information.

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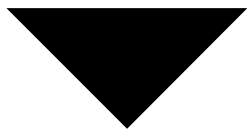
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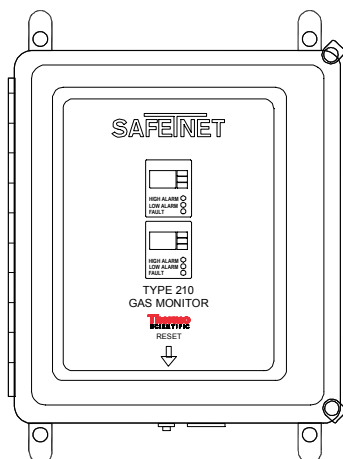


# INTRODUCTION

## Description

Safe T Net is a family of fixed-instrument, continuous-monitoring systems.

The Safe T Net 210 is a two-channel wall-mounted controller module that receives analog gas measurement signals from one or two remote gas transmitters and displays the gas concentrations on two digital display screens. In addition, the Safe T Net 210 provides two analog outputs proportional to the gas measurement signals.



**Figure 1-1 Safe T Net 210 Two-channel Controller**

When gas concentrations exceed pre-programmed levels, the Safe T Net 210 provides visible and audible signals as well as relay activation to indicate low and high gas alarms. When instrument fault conditions occur, the Safe T Net 210 provides visible and audible signals as well as relay closure.

The Safe T Net 210 can be configured for either 115 or 230 VAC power and, in turn, provides DC power to the remote transmitters, including diffusion and sample-draw transmitters.

The Safe T Net 210 can be connected to many Thermo Fisher Scientific transmitters, making it capable of detecting a broad range of gases. Appendix B, Transmitters, lists the transmitters you can order with your controller.

## **Features**

- Accepts one or two channels of standard 4 to 20 mA analog input signals from remote 2- or 3-wire transmitters for detecting combustible gas, toxic gas, or oxygen concentrations.
- Simultaneously displays the current gas reading for both channels.
- Provides a 4 to 20 mA analog output for each channel.
- Warns you of hazardous gas concentration conditions with audible and visual indications at two alarm setpoints for each channel.
- Provides a low and a high alarm relay for each channel.
- Fault circuit provides visual, audible, and relay indications to warn you of detector failure or other malfunctions.
- Components are enclosed in a wall-mounted NEMA 4X housing.

## **Programmable Relay Operation**

Each active channel has two relays: Low alarm and high alarm. A master fault relay activates if either channel is in a fail condition. You can program the relays for latching or self-resetting alarm logic, energizing or de-energizing relay activation (low and high alarm relays), activation on rising or falling signal levels, and time delay (0 to 30 seconds) to avoid false alarms due to radio frequency interference (RFI) or electromagnetic interference (EMI).

## **Accessories**

The standard and optional accessories for the Safe T Net 210 (see Appendix A for parts numbers).

- Operators Manual (standard)
  - Includes detailed installation, operation, maintenance, and calibration procedures for the Safe T Net 210.
- AC line cord (optional)
  - Three-conductor cable with reducer and cord grip for installation.

## Specifications

Table 1-1 lists the specifications of the Safe T Net 210. See Appendix B, Transmitters, for gas detection specifications.

**Table 1-1 Safe T Net 210 Specifications**

Range	Adjustable to 999. Decimal can be set in any position.
Analog signal inputs	Two 24 VDC, 4 to 20 mA analog input signals, source-type, two- or three-wire
Analog outputs	One 4 to 20 mA source for each channel, 1000 OHMS maximum @ 24 VDC input
Relay outputs	Low alarm relay (Form C) and high alarm relay (Form A) for each channel, programmable for latching/non-latching, and energized/de-energized. Common fault (Form B), normally energized, programmable for latching/non-latching. Each relay rated at 10 AMP/125 VAC.
AC power	Nominal: 115 VAC, 60 Hz (Tolerance: 85 to 132 VAC, 47-63 Hz) or 230 VAC, 60 Hz (Tolerance: 170 to 264 VAC, 47-63 Hz)
Current consumption	0.4 Amp maximum
Fuses	AC fuse: GMA 2, 250 V/2 Amp (115V system) AC fuse: SO-BLO, 250 Volts, 1 Amp (230V system) DC fuse: 3AG-1, 250 V/1 Amp
Low alarms	<ul style="list-style-type: none"> <li>- Independently adjustable from OFF to full scale</li> <li>- Audible and visual indication</li> <li>- Acknowledged using the RESET button</li> <li>- Programmable to activate on rising or falling level</li> </ul>
High alarms	<ul style="list-style-type: none"> <li>- Independently adjustable from OFF to full scale</li> <li>- Audible and visual indication</li> <li>- Programmable to activate on rising or falling level</li> </ul>
Common fault alarm	Programmable to activate at 3.7 mA, 3.2 mA, or 2.0 mA input signal. Can be disabled. Factory setting: 3.7 mA.
Calibration time out	Programmable from 0 (no time out) to 99 minutes
Alarm delay	Programmable from 0 (no delay) to 30 seconds
Operating temperature	-20° to +45°C (-5° to +115°F).

**Table 1-1     Safe T Net 210 Specifications**

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Operating humidity	0 to 100% RH non-condensing
Enclosure rating	NEMA 4X
Overall Dimensions	10.50" (267 mm) W, 12.50" (318 mm) H, 6.25" (159 mm) D
Weight	Approximately 8lbs (3.8 Kg)
Case material	Molded fiberglass polyester
Approvals	UL Classified, CSA certified (File No. LR60959-35C)

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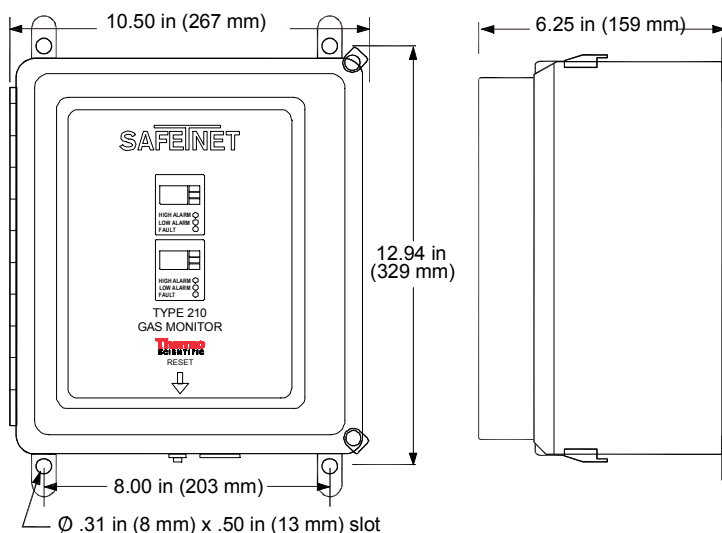
# INSTALLATION & START UP



## WARNING

Perform all installation procedures in a fresh air environment (known to be free of combustible and toxic gas and having normal oxygen content). The Safe T Net 210 is not in operation as a gas monitoring system until the start-up procedure is complete.

## Mounting



**Figure 2-1 Outline and Mounting Dimensions**

The Safe T Net 210 controller is suitable for mounting on a vertical surface using four screws through the mounting tabs on the corners of the housing.



## CAUTION

**The Safe T Net 210 is suitable for installation in a non-hazardous environment (where general purpose equipment is used). The Safe T Net 210 is not suitable for installation in Class I, Division 1, or Division 2 areas.**

---

1. Consider the following factors when you select the mounting site:
  - The installation should be in a safe area, preferably near an entrance door where the fire department or other emergency response team can see the indication if an alarm has caused the building to be evacuated.
  - AC power must be available.
  - Provide room to open the housing door.
  - Provide room to make wiring connections through the conduit hubs.
2. Close and latch the housing door.
3. Position the Safe T Net 210 on a vertical surface at eye level (approximately 5 feet (1.5 m) above the floor).
4. Secure the housing to the vertical surface with one 1/4 inch screw through each mounting tab.

## Wiring

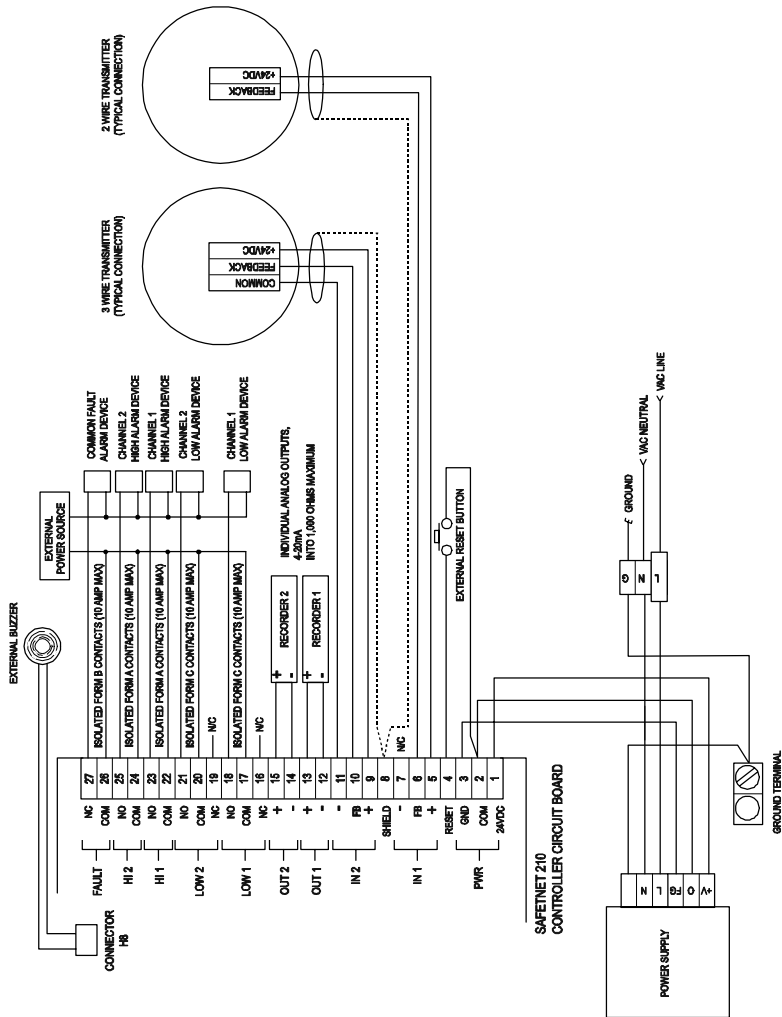


Figure 2-2 Wiring Diagram

### Conduit Hubs

Three 3/4" NPT conduit hubs provide routing for input and output wiring to the Safe T Net 210.



### CAUTION

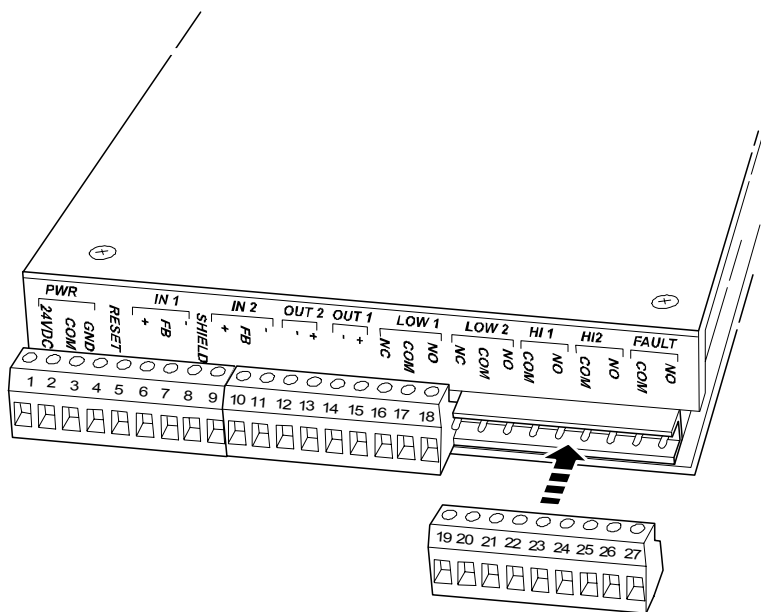
Isolate analog signal wiring from AC power wiring.

A typical Safe T Net 210 wiring scheme is arranged as follows:

- The incoming AC wiring and the relay output wiring are routed through the left conduit hub.
- The channel 1 and channel 2 input/output wiring is routed through the center and right conduit hubs, including:
  - Power and signal leads to the channel 1 and channel 2 transmitters
  - Analog outputs to the channel 1 and channel 2 recorders or other monitoring devices

### Controller Module Terminal Strip

The controller module terminal strip is composed of three connectors of nine terminals each. The connectors can be removed to facilitate installation and service operations and keyed to prevent them from being interchanged. The 27 screw-type terminals accept wire up to 12 gauge.



**Figure 2-3 Controller Circuit Board Terminal Strip**

**Table 2-1 Safe T Net 210 Terminal Strip**

Terminal Label	Terminal Number	Description	
NC COM	T27 T26	Normally closed <sup>1</sup> Common	Common fault relay
NO COM	T25 T24	Normally open <sup>2</sup> Common	Channel 2 high alarm relay
NO COM	T23 T22	Normally open <sup>2</sup> Common	Channel 1 high alarm relay
NO COM NC	T21 T20 T19	Normally open Common Normally closed	Channel 2 low alarm relay
NO COM NC	T18 T17 T16	Normally open Common Normally closed	Channel 1 low alarm relay
+ -	T15 T14	4 to 20 mA Common	Channel 2 4 to 20 mA analog output signal
+ -	T13 T12	4 to 20 mA Common	Channel 1 4 to 20 mA analog output signal
- FB +	T11 T10 T9	Common Signal +24 VDC	Channel 2 4 to 20 mA analog input signal
SHIELD	T8	Shield	
- FB +	T7 T6 T5	Common Signal +24 VDC	Channel 1 4 to 20 mA analog input signal
RESET	T4	External RESET button	
GND COM 24 VDC	T3 T2 T1	Ground (chassis) Common (circuit ground) +24 VDC	Power in

1. The fault relay is normally energized and de-energizes in a fault condition such that contact closure occurs between C and NC in a fault condition.
2. Can be factory configured to be normally closed and open on alarm.

## Connecting the Transmitters

The Safe T Net 210 controller can be used with any two standard 2- or 3-wire 4 to 20 mA analog transmitters. See the transmitter manual for wiring instructions. When changing transmitter types, see the Programming section of this chapter for Safe T Net 210 programming instructions.

## Connecting External Alarm Devices



### CAUTION

**External alarms are controlled by the alarm relays. The relays are rated for 10 Amps maximum. Do not connect any device with a current load that exceeds the limit of the relay.**

---

1. Run the external alarm wires through the left conduit hub.
2. Connect the external alarm wires to the controller module terminal strip as shown in Figure 2-2. Terminals 16 through 25 pertain to the channel 1 and channel 2 low and high gas alarm relays.
  - Connect the positive or hot wire of the external power source to the C (common) terminal of the corresponding relay.
  - Connect the positive or hot wire of the external alarm device to the NC (normally closed) or NO (normally open) terminal of the corresponding relay, as appropriate.
  - Connect the negative or neutral lead of the external power source to the negative or neutral lead of the alarm device.



### NOTE

The low and high alarm relays are factory set to be deenergized in normal operation, and to energize when the Safe T Net 210 is in alarm condition. Each alarm relay can be individually reprogrammed to energize in normal condition and de-energize when an alarm occurs. To reprogram the alarm relays, use the U9 and U10 DIP switch settings described in the Changing the Settings section in this chapter.

The common fault relay is energized in normal operation and de-energizes when the Safe T Net 210 is in fault condition. The fault relay cannot be programmed for normally de-energized operation.

NO (normally open) and NC (normally closed) describe the condition of the relay when it is de-energized. If the relay is energized in normal operation, NC is open and NO is closed.

---

## Wiring the Analog Outputs

1. Run the analog output leads through the selected conduit hubs (not the same conduit hub as the AC wiring and the external alarm wires).
2. Connect the analog output leads to the controller circuit board terminal strip as shown in Figure 2-2. Terminals 12 through 15 pertain to the channel 1 and channel 2 analog output signals.
  - Connect the positive lead of the external monitoring device to the positive (+) terminal of the output signal for that channel.
  - Connect the negative lead of the external monitoring device to the negative (–) terminal of the output signal for that channel.



### CAUTION

**The maximum input impedance of the monitoring device must not exceed 1,000 ohms.**

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## Wiring AC Power

The Safe T Net 210 operates from either 115 or 230 VAC power.



### WARNING

**Verify that the AC power you are using matches the power supply installed in the Safe T Net 210. Refer to the Controller Module label for verification.**

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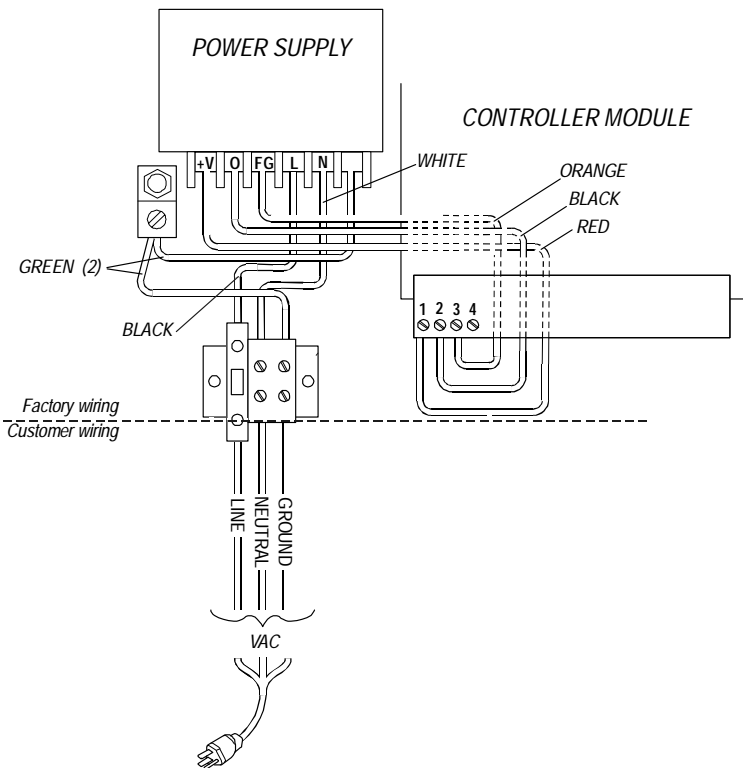
### WARNING

**Make all of the internal connections before you turn on the AC power. Always turn off the AC power before making any wiring changes.**

---

1. Run the optional AC line cord assembly or other AC power line through the left conduit hub.
2. Connect the incoming AC leads to terminals L, N, and G of the AC terminal block (see Figure 2-4):
  - Connect the line (“hot”, black) lead to L.
  - Connect the neutral (white) lead to N.
  - Connect the ground (green) lead to G.

3. The wiring between the AC terminal block and the power supply is installed at the factory. This information is included in case the power supply needs to be replaced.
- The black lead goes from the L terminal of the AC terminal block to the L terminal of the power supply.
  - The white lead goes from the N terminal of the AC terminal block to the N terminal of the power supply.
  - The green lead goes from the G terminal of the AC terminal block to the large ground terminal next to the power supply.



**Figure 2-4 AC and DC Power Wiring**

## **Wiring DC Power**

The DC power wiring between the AC terminal block, the power supply, and the controller module is installed at the factory. This information is included in case the power supply or the controller need to be replaced.

Connect the DC leads between the power supply and terminals 1 through 3 of the controller module (see Figure 2-4):

1. Connect the positive (+) lead from power supply terminal +V to controller terminal 1 (24VDC).
2. Connect the negative (–) lead from power supply terminal O to controller terminal 2 (COM).
3. Connect the ground lead from power supply terminal FG to controller terminal 3 (GND).

## **Programming**

The Safe T Net 210 can be programmed for any gas detection application supported by the 4 to 20 mA transmitters listed in Appendix B, Transmitters.

Using the programming switches and buttons along the edge of the controller module circuit board, you can set the following parameters for each channel:

- Channel settings:
  - Range
  - Decimal place
  - Indicated gas units (PPM, %LEL, %VOL)
  - Low and high alarm levels
- Gas alarm relays:
  - Latching or self-resetting
  - Normally energized or de-energized
  - Activated on rising or falling level
- Fault alarm:
  - Activation level
  - Relay latching or self-resetting
- Alarm buzzer enabled or disabled
- Calibration time out
- Alarm delay

## Standard Settings

**Table 2-2     Standard Factory Settings**

---

Low Alarm	Form C Normally de-energized Latching (O <sub>2</sub> alarms are self-resetting.) Activated on a rising concentration (O <sub>2</sub> low alarm is activated on a falling concentration.)
High Alarm	Form A Normally de-energized Latching (O <sub>2</sub> alarms are self-resetting.) Activated on a rising concentration
Fault Alarm	Form B Normally energized Self-resetting Fault alarm setpoint: 3.7 mA analog input signal
Alarm Delay	One second
Calibration time out	15 minutes
Buzzer	Enabled

---

The standard ranges for various transmitter types are listed in Appendix B, Transmitters.



### **CAUTION**

**The standard ranges provide optimum performance of each transmitter type. Contact Thermo Fisher Scientific before using a non-standard range.**

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## Changing the Settings

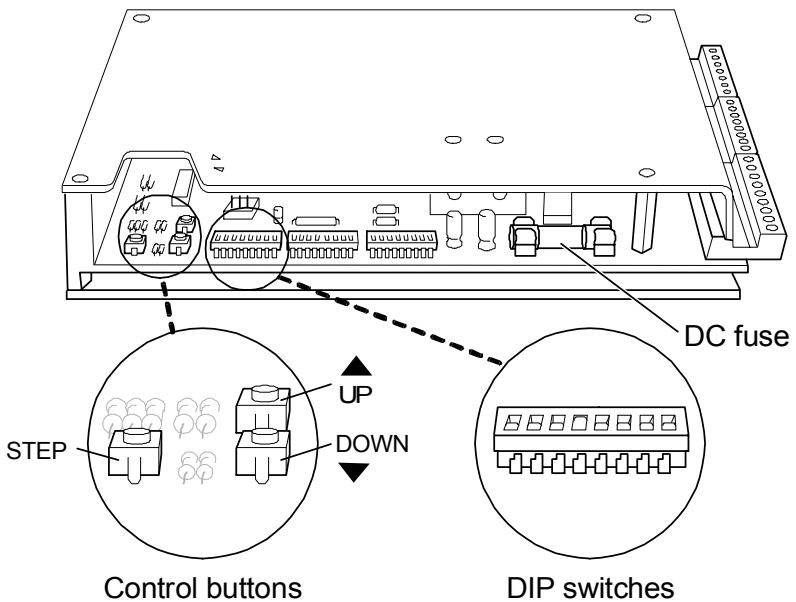
The settings are made using the three DIP switches (U1, U9, U10) and three buttons, STEP, ▲ (UP), and ▼ (DOWN), located at the edge of the controller module circuit board.

On the DIP switches, ON is the switch position to the right (away from the edge of the board) and OFF is to the left (toward the edge of the board).



### NOTE

While the Safe T Net 210 is in any of its set-up modes, the 4 to 20 mA analog output signals fall to 1.5 mA.



**Figure 2-5 Controller Board Switches and Programming Buttons**

**DIP SWITCH U1 (COMMON SETTINGS)**

U1 is the DIP switch closest to the top of the module (adjacent to the control buttons). The switches of U1 control the settings common to both channels.

**Table 2-3     DIP switch U1 - Settings Common to Both Channels**

<b>Switch</b>	<b>Position</b>	<b>Function</b>
1 (top)	ON	Enable set-up mode 1 for both channels. See Set-up Mode 1 in this chapter.
	OFF	Normal operation
2	ON	Enable set-up mode 2 for both channels. See Set-up Mode 2 in this chapter.
	OFF	Normal operation
3	ON	Enable set-up mode 3 for both channels. See Set-up Mode 3 in this chapter.
	OFF	Normal operation
4	ON	Select channel 1 (set-up mode 3)
	OFF	Select channel 2 (set-up mode 3)
5	ON	Fault relay latched
	OFF	Fault relay unlatched (self-resetting)
6	Switches 6 and 7 are used together to set the fault alarm setpoint.	
7	See Fault Alarm Setpoint in this chapter.	
8 (bottom)	ON	Enable alarm buzzer
	OFF	Disable alarm buzzer

---

## DIP SWITCH U9 (CHANNEL 1 RELAYS)

U9 is the middle of the three DIP switches. The switches of U9 control the operation of the channel 1 low and high relays. Switch 7 turns channel 1 on and off.

**Table 2-4 DIP switch U9 - Channel 1 Settings**

Switch	Position	Function
1 (top)	ON	Channel 1 low relay latched
	OFF	Channel 1 low relay unlatched (self-resetting)
2	ON	Channel 1 low relay normally de-energized
	OFF	Channel 1 low relay normally energized
3	ON	Channel 1 low relay activated on falling level
	OFF	Channel 1 low relay activated on rising level
4	ON	Channel 1 high relay latched
	OFF	Channel 1 high relay unlatched (self-resetting)
5	ON	Channel 1 high relay normally de-energized
	OFF	Channel 1 high relay normally energized
6	ON	Channel 1 high relay activated on falling level
	OFF	Channel 1 high relay activated on rising level
7	ON	Channel 1 OFF <sup>1</sup>
	OFF	Channel 1 ON
8 (bottom)	OFF	Must be set to OFF only

1. When channel 1 is off, the display shows OFF, the status LEDs (HIGH ALARM, LOW ALARM, and FAULT) are off, the relays are held in the inactive state, the analog output is 0 mA, and the channel cannot be placed in calibration mode.

**DIP SWITCH U10 (CHANNEL 2 RELAYS)**

U10 is the bottom DIP switch (closest to the fuse). The switches of U10 control the operation of the channel 2 low and high relays. Switch 7 turns channel 2 on and off.

**Table 2-5     DIP switch U10 - Channel 2 Settings**

---

Switch	Position	Function
1 (top)	ON	Channel 2 low relay latched
	OFF	Channel 2 low relay unlatched (self-resetting)
2	ON	Channel 2 low relay normally de-energized
	OFF	Channel 2 low relay normally energized
3	ON	Channel 2 low relay activated on falling level
	OFF	Channel 2 low relay activated on rising level
4	ON	Channel 2 high relay latched
	OFF	Channel 2 high relay unlatched (self-resetting)
5	ON	Channel 2 high relay normally de-energized
	OFF	Channel 2 high relay normally energized
6	ON	Channel 2 high relay activated on falling level
	OFF	Channel 2 high relay activated on rising level
7	ON	Channel 2 OFF <sup>1</sup>
	OFF	Channel 2 ON
8 (bottom)	OFF	Must be set to OFF only

---

1. When channel 2 is off, the display shows OFF, the status LEDs (HIGH ALARM, LOW ALARM, and FAULT) are off, the relays are held in the inactive state, the analog output is 0 mA, and the channel cannot be placed in calibration mode.

---

**SET-UP MODE 1 (RANGES AND ALARM SETPOINTS)**

Set-up mode 1 is used to set the following range and alarm levels for channel 1 and channel 2.

- Channel 1 range, low alarm, and high alarm
- Channel 2 range, low alarm, and high alarm



---

**CAUTION**

**The standard ranges are listed in Appendix B, Transmitters of the Safe T Net 210 Operator's Manual provide optimum performance of each transmitter type. Contact Thermo Fisher Scientific before using a non-standard range.**

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You can exit set-up mode 1 by setting switch 1 to OFF at any point during the procedure without losing your settings. In addition, range and alarm settings are retained by the Safe T Net 210 even when power is removed. While the Safe T Net 210 is in set-up mode 1, both 4 to 20 mA analog outputs go to 1.5 mA.

1. Initiate set-up mode 1 by placing U1 switch 1 in the ON position (away from the edge of the board).
2. The channel 1 display, LOW ALARM LED, and HIGH ALARM LED flash. Channel 1 range cannot be set using the ▲ (UP) and ▼ (DOWN) buttons.
3. Press the STEP button to accept the desired value and go to the next setting.
4. The channel 1 display and LOW ALARM LED flash. Channel 1 low alarm level can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
5. Press the STEP button to accept the desired value and go to the next setting.
6. The channel 1 display and HIGH ALARM LED flash. Channel 1 high alarm level can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
7. Press the STEP button to accept the current value and go to the next setting.
8. The channel 2 display, LOW ALARM LED, and HIGH ALARM LED flash. Channel 2 range cannot be set using the ▲ (UP) and ▼ (DOWN) buttons.
9. Press the STEP button to accept the desired value and go to the next setting.
10. The channel 2 display and LOW Alarm LED flash. Channel 2 low alarm level can now be set using the ▲ (UP) and ▼ (DOWN) buttons.

11. Press the STEP button to accept the desired value and go to the next setting.
12. The channel 2 display and HIGH ALARM LED flash. Channel 2 high alarm level can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
13. Return U1 switch 1 to OFF to resume normal operation.

#### SET-UP MODE 2 (GAS UNITS AND DECIMAL PLACE)

Set-up mode 2 is used to set the following parameters individually for channel 1 and channel 2.

- Channel 1 decimal place
- Channel 1 indicated gas units (PPM, %LEL, %VOL)
- Channel 2 decimal place
- Channel 2 indicated gas units (PPM, %LEL, %VOL)

You can exit set-up mode 2 by setting switch 2 to OFF at any point during the procedure without losing your settings. In addition, decimal place and gas unit settings are retained by the Safe T Net 210 even when power is removed. While the Safe T Net 210 is in set-up mode 2, both 4 to 20 mA analog outputs go to 1.5 mA.

1. Initiate set-up mode 2 by placing U1 switch 2 in the ON position (away from the edge of the board).
2. The channel 1 display flashes, showing full scale range. The channel 1 decimal place can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
3. Press the STEP button to accept the desired value and go to the next setting.
4. The channel 1 display shows only the decimal point chosen; the selected gas units flash. The channel 1 gas units (PPM, %LEL, %VOL) can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
5. Press the STEP button to accept the desired value and go to the next setting.
6. The channel 2 display flashes, showing full scale range. The channel 2 decimal place can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
7. Press the STEP button to accept the desired value and go to the next setting.
8. The channel 2 display shows only the decimal point chosen; the selected gas units flash. The channel 2 gas units (PPM, %LEL, %VOL) can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
9. Return U1 switch 2 to OFF to resume normal operation.

## SET-UP MODE 3

Set-up mode 3 is a factory-only calibration that calibrates the signal input circuitry to recognize the 0 mA and 20 mA analog inputs.



### CAUTION

**Set-up Mode 3 is a factory adjustment and is not generally meant to be made by the user.**

1. Initiate set-up mode 3 by placing U1 switch 3 in the ON position (away from the edge of the board).
2. Select channel 1 (switch 4 = ON) or channel 2 (switch 4 = OFF).
3. The selected display and status LEDs flash.
4. With no signal (0 mA) applied to the channel input terminals, press the ▼ (DOWN) button.
5. Apply 20.0 mA to the channel input terminals and press the ▲ (UP) button.
6. Return U1 switch 3 to OFF to resume normal operation.

While the Safe T Net 210 is in set-up mode 3, both 4 to 20 mA analog output signals go to 1.5 mA.

## FAULT ALARM SETPOINT

The Safe T Net 210 generates a fault alarm when either of the channel analog input signals drops below the 4.0 mA analog input signal zero point to the programmed fault alarm setpoint. The setting applies to both channel inputs. When the fault alarm is triggered, the FAULT LED lights, the buzzer sounds, and the fault relay de-energizes and the contacts close.

Set the fault alarm setpoint by setting U1 switches 6 and 7 as shown in Table 2-6.

**Table 2-6 Fault Alarm Trigger Levels**

Fault Alarm Analog Input Signal Setpoint	U1 Switch 6	U1 Switch 7
2.0 mA	OFF	ON
3.2 mA ON		OFF
3.7 mA (factory setting)	ON	ON

## CALIBRATION TIME-OUT MODE

If calibration time out mode is not turned off manually, the Safe T Net 210 automatically returns to normal operation from calibration mode after a preprogrammed time from 0 (no time out) to 99 minutes.



### NOTE

The standard calibration time out factory setting is 15 minutes.

---

Program the calibration time out as follows:

1. While in normal operation, press the STEP and ▼ (DOWN) buttons simultaneously to initiate the calibration time out setup mode.
2. The channel 1 LOW and HIGH ALARM LEDs are lit, the display shows the current calibration time out setting in minutes. The calibration time out can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
3. Press the STEP button to accept the desired value and resume normal operation.



### CAUTION

**The visual and audible alarm indications and relays are inactive during calibration time out and will not indicate any hazardous gas concentrations that may occur while calibration mode is enabled.**

---

## ALARM DELAY

The Safe T Net 210 can be programmed to delay the operation of alarm relays and status LEDs for a pre-determined time after alarm levels have been exceeded. This feature prevents nuisance alarms caused by transient radio frequency interference (RFI). The alarm delay can be set from 0 (no delay) to 30 seconds.



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### NOTE

The standard alarm delay factory setting is one second.

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### WARNING

**Audible and visible alarm indicators are not active, and relays not activated, for the length of the alarm delay.**

---

Set the alarm delay as follows:

1. While in normal operation, press the ▲ (UP) and ▼ (DOWN) buttons simultaneously to initiate the alarm delay set-up mode.
2. The channel 1 display shows the current alarm delay in seconds. The alarm delay can now be set using the ▲ (UP) and ▼ (DOWN) buttons.
3. Press the STEP button to accept the desired value and resume normal operation.

## Start-Up

Complete the following procedures to place the Safe T Net 210 in normal operation.

### Preparing for Start Up

1. Complete the mounting and wiring procedures described earlier in this chapter.
2. Complete all installation procedures described in the Transmitters manual.
3. Verify that all wiring connections are correct and secure.

### Introducing Power

Turn on the incoming power at the power source.



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### NOTE

The low alarm, high alarm, and fault circuits are not active for 1 minute after power is applied to the Safe T Net 210. This time delay minimizes false alarms during transmitter warm-up.

---

## **Verifying Indicator Lights**

1. Verify that the displays are on.
2. If no light comes on during the start-up sequence, the Safe T Net 210 is not receiving power. Check the wiring connection, the power source, and the fuses. See Chapter 5, Maintenance, for detailed troubleshooting instructions.
3. Table 2-7 lists the conditions indicated by the status indicator lights during start up and the suggested response for each condition.

**Table 2-7     Start Up Indications**

<b>Indicators</b>	<b>Probable Status</b>	<b>Recommended Response</b>
Displays and other lights on.	Receiving power.	None
FAULT LED on.	Below-zero reading.	<ol style="list-style-type: none"><li>1. Allow the transmitter to warm-up.</li><li>2. Zero the transmitter output.</li><li>3. Replace detector if the below-zero reading continues.</li><li>4. See the Troubleshooting section of Chapter 5, Maintenance.</li></ol>
	Detector, transmitter, or circuitry is broken, incomplete, or incorrect.	<ol style="list-style-type: none"><li>1. Verify transmitter and detector wiring is correct and secure.</li><li>2. See the Troubleshooting section of the Transmitters manual.</li></ol>
ALARM LED on.	Above-zero reading	<ol style="list-style-type: none"><li>1. Zero detector after warm up.</li></ol>
All displays and LEDS off.	No power	<ol style="list-style-type: none"><li>1. Check AC and DC fuses and power wiring.</li></ol>

Start up is complete, and the Safe T Net 210 is operating in normal mode.

# NORMAL OPERATION AND ALARMS

## Normal Operation

Normal operation is any time the start-up procedure is complete, no calibration or set-up procedures are in progress, and no alarm, or fault condition exists. During normal operation, the Safe T Net 210 behaves as follows:

- The display screens display the current gas concentrations (channel 1 on the top screen, channel 2 on the bottom screen).
- The 4 to 20 mA analog output signals at the terminal strip (terminals 12 and 13 for channel 1, 14 and 15 for channel 2) correspond to the displayed gas readings.
- The HIGH ALARM, LOW ALARM, and FAULT lights and relays for both channels are deactivated.

## Alarms

This section describes the Safe T Net 210 indications for low alarm, high alarm, and fault conditions, including the standard relay action.

The Safe T Net 210 activates visual, audible, and relay alarm indications when any of the programmed alarm setpoints are passed.



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### WARNING

**The calibration mode feature of the Safe T Net 210 allows you to disable the alarm LED's, buzzer, and relays during calibration procedures and response tests. When calibration mode is activated, the LED'S, buzzer, and relays will not operate as described in this section.**

---

- Table 3-1 lists the Safe T Net 210's alarm indications. The table shows Thermo Fisher Scientific standard settings for alarm action and relay activation.
- The Standard Range and Alarm Setpoint tables in each transmitter manual lists the standard low and high alarm setpoints for the transmitters supplied with your Safe T Net 210.
- You can adjust the relay action using the setup modes described in Chapter 2, Installation and Start Up.

**Table 3-1 Audible and Visual Alarm Indications**

<b>Condition</b>	<b>Cause</b>	<b>Visual Indication</b>	<b>Buzzer, if activated</b>
Normal	Start up complete; no gas alarm or fault conditions.	Displays on	None
Low Alarm	Increasing reading at or above low alarm setpoint.	LOW ALARM LED on	Pulsing
Low Alarm (Oxygen channel)	Decreasing O <sub>2</sub> reading at or below low alarm setpoint.	LOW ALARM LED on	Pulsing
High Alarm	Increasing reading at or above high alarm setpoint.	HIGH ALARM LED on	Pulsing
Fault	Incomplete, broken, or incorrect detector, amplifier, or circuitry; Below zero analog input signal from transmitter.	FAULT LED on; gas reading alternates with FLt	Pulsing

## Low Alarm

When the displayed gas concentration passes the programmed low alarm setpoint:

- The LOW ALARM LED lights.
- The buzzer pulses.
- The low alarm relay activates.

If the alarm is set to trigger on a rising level, the indications continue, unless reset, until the concentration decreases below the setpoint.

If the alarm is set to trigger on a falling level, the indications continue, unless reset, until the concentration increases above the setpoint.

**RESET:** Press the RESET button on the bottom of the housing to reset the alarm. This causes the low alarm relay to deactivate and the buzzer to silence. The LOW ALARM LED continues to flash until the alarm condition passes.

Thermo Fisher Scientific sets the low alarm set points (except oxygen) for latching action. Oxygen channel low alarms are factory programmed to be self-resetting. You can select latch or self-reset alarm action in the setup modes described in Chapter 2, Installation and Start Up.

If the low alarm is latching: If the low alarm has been configured to be latching, and the alarm has not been acknowledged, the buzzer, LED and relay remain active after the alarm condition has passed. These alarm indications must then be cleared by pressing the RESET button on the bottom of the housing.

1. Follow the established procedure for a low level combustible or toxic gas condition (or a decreasing oxygen condition). If a procedure is not in place, establish one that is appropriate for your application.
2. When the reading returns to normal, press the RESET button to silence the buzzer, turn off the LOW ALARM light, deactivate the alarm relay, and reset the alarm circuit.

If the low alarm is self-resetting:

1. Follow the established procedure for a low level combustible or toxic gas condition or a decreasing oxygen condition. If a procedure is not in place, establish one that is appropriate for your application.
2. After the reading returns to normal, the Safe T Net 210 automatically silences the buzzer, turns off the LOW ALARM light, deactivates the applicable alarm relay, and resets the alarm circuit.

### High Alarm

When the display level passes the programmed high alarm setpoint:

- The HIGH ALARM LED lights.
- The buzzer continues to pulse.
- The high alarm relay activates.

If the alarm is set to trigger on a rising concentration, the indications continue until the reading decreases below the setpoint and, if the alarm is latching, the RESET button is pressed.

If the alarm is set to trigger on a falling concentration, the indications continue until the reading increases above the setpoint and, if the alarm is latching, the RESET button is pressed.



#### NOTE

Unlike the low alarm, you cannot reset the high alarm while the reading is at or above the high alarm set point.

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**Thermo** GasTech sets the high alarms (except oxygen) for latching alarm action. Oxygen channel high alarms are factory-programmed to be self-resetting. You can select latch or self-reset alarm action in the Setup modes described in Chapter 2, Installation and Start Up.

If the high alarm is latching: If the high alarm has been configured to be latching, the buzzer, LED, and relay remain active after the alarm condition has passed. The high alarm indications can only be cleared by pressing the RESET switch on the bottom of the housing.

1. Follow the established procedure for a high level combustible, toxic, or oxygen gas condition. If a procedure is not in place, establish one that is appropriate for your application.



#### **NOTE**

You cannot silence the buzzer while the Safe T Net 210 is in a high alarm condition. The reading must decrease below the high alarm setpoint before you can silence the buzzer.

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2. After the reading decreases below the high alarm setpoint, press the RESET button to turn off the HIGH ALARM light, deactivate the alarm relay, and reset the alarm circuit.

If the high alarm is self-resetting:

1. Follow the established procedure for a high level combustible, toxic, or oxygen gas condition. If a procedure is not in place, establish one that is appropriate for your application.



#### **NOTE**

You cannot silence the buzzer while the Safe T Net 210 is in a high alarm condition. The reading must decrease below the high alarm setpoint before you can silence the buzzer.

---

2. After the reading decreases below the high alarm setpoint, the Safe T Net 210 automatically turns off the HIGH ALARM light, de-energizes the high alarm relay, and resets the high alarm circuit.
3. When the reading decreases below the high alarm setpoint, the Safe T Net 210 may still be in low alarm condition. Respond to the low alarm condition as appropriate.

## **Fault Condition**

The fault alarm is activated when the 4 to 20 mA analog input from a transmitter falls below the 4 mA zero point to the programmed fault alarm setpoint. This can be caused by such factors as a drifting sensor input or a broken wire connection. When a fault alarm occurs, the indications are as follows:

- The FAULT LED lights.
- The display alternates between the gas reading and FLt.
- The buzzer and fault relay activate.

The fault relay is programmable to be latching or self-resetting. The fault relay is normally energized and de-energizes in fault condition.

The fault alarm setpoint can be changed using the programming controls. See the Fault Alarm Level section of Chapter 2, Installation and Start Up.

If a fault condition occurs:

1. Make sure the wiring connections at the Safe T Net 210 terminal strip are correct and secure.
2. See the Troubleshooting section in Chapter 5, Maintenance.



## CALIBRATION

No calibration of the Safe T Net 210 controller is required. Refer to the transmitter manual for instructions on setting the analog output signal from the transmitter.

### Calibration Mode

To avoid unwanted alarms during the calibration procedure, either or both of the channels of the Safe T Net 210 can be placed in calibration mode. In calibration mode, the alarm LEDs and relays of the channel remain inactive, the buzzer remains off, and the analog output signal goes to 1.5 mA. Activate calibration mode by pressing the CALIBRATE button through the opening marked CALIBRATE on the display module cover plate inside the housing door.

If you do not turn off calibration manually, it will turn off automatically when the calibration time-out has elapsed (standard factory setting is 15 minutes). See the Calibration Time Out section of Chapter 2, Installation and Start Up, for programming instructions.



#### CAUTION

**The visual and audible alarm indications and relays are inactive during calibration time out and will not indicate any hazardous gas concentrations that may occur while calibration mode is enabled.**

Calibration mode has four settings (see Table 4-1).

**Table 4-1 Calibration Mode Settings**

<b>CALIBRATE button</b>	<b>Channel 1 Status</b>	<b>Channel 2 Status</b>
Press 1 time	Calibration mode	Normal operation
Press 2nd time	Calibration mode	Calibration mode
Press 3rd time	Normal operation	Calibration mode
Press 4th time	Normal operation	Normal operation

1. Pressing the CALIBRATE button the first time puts channel 1 only into calibration mode:
  - The display for channel 1 flashes, alternating the gas reading with CAL.
  - Channel 1 LOW, HIGH, and FAULT LEDs flash.
  - The channel 1 relays remain inactive and the analog output signal goes to 1.5 mA.
  - Channel 2 remains in the normal monitoring mode.
  - The display for channel 1 can now exceed the alarm levels without activating the channel 1 alarm relays.
2. Pressing the CALIBRATE button a second time puts both channels into calibration mode:
  - The displays for both channels flash, alternating the gas readings with CAL.
  - The LOW, HIGH, and FAULT LEDs for both channels flash.
  - The relays for both channels remain inactive and both analog output signals go to 1.5 mA.
  - The display for either or both channels can now exceed the alarm levels without activating the alarm relays.
3. Pressing the CALIBRATE button a third time returns channel 1 to the normal operation and puts channel 2 into calibration mode:
  - The display for channel 2 flashes, alternating the gas reading with CAL.
  - The channel 2 LOW, HIGH, and FAULT LEDs flash.
  - The channel 2 relays remain inactive and the analog output signal falls to 1.5 mA.
  - Channel 1 remains in the normal monitoring mode.
  - The display for channel 2 can now exceed the alarm levels without activating the channel 2 alarm relays.
4. Pressing the CALIBRATE button a fourth time returns both channels to normal operation.

# MAINTENANCE



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**WARNING**

**Perform all maintenance procedures described in this chapter in a non-hazardous environment.**

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## Routine Maintenance

Routine maintenance of the Safe T Net 210 consists only of periodic checks to ensure that the system remains on zero (20.9% for O<sub>2</sub>) and is responsive to gas. The transmitters used with the Safe T Net 210 must be calibrated at regular intervals following the procedures described in the transmitter inserts.

## Interchangeability of Components

The Safe T Net 210 controller can be used with any standard 2- or 3-wire 4 to 20 mA analog transmitter. When changing transmitter types, it may be necessary to change the range, decimal point, and alarm setpoints for the affected channel. Follow the instructions for programming the Safe T Net 210 in Chapter 2, Installation and Start Up.

## Troubleshooting

This troubleshooting guide describes symptoms, probable causes, and recommended actions for problems you may encounter with the Safe T Net 210 (refer to Table 5-1). This guide covers the Safe T Net 210 only, see the Troubleshooting section in the Transmitters manual, for problems you may encounter with the transmitters.

**Table 5-1 Troubleshooting**

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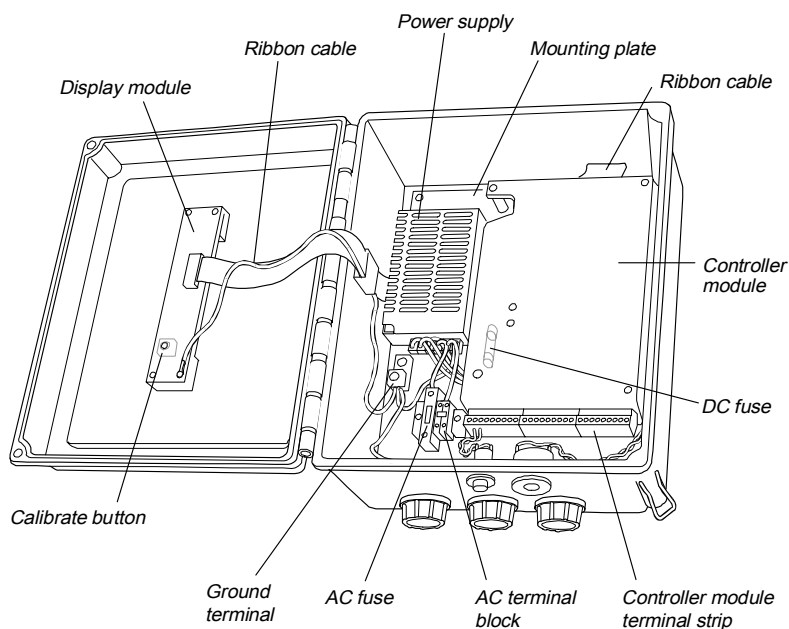
Problem	Symptoms	Probable Cause	Recommended Action
No Display or Lights	No readings or message on the display screens and no indicator lights.	<ul style="list-style-type: none"> <li>• Incomplete or incorrect power circuit.</li> <li>• Poorly connected or failed power supply.</li> <li>• Failed AC or DC fuse.</li> <li>• Poorly connected or failed controller module.</li> <li>• Poorly connected or failed display.</li> <li>• Poorly connected or failed ribbon cable.</li> </ul>	<ol style="list-style-type: none"> <li>1. Verify that AC power is on.</li> <li>2. Verify correct connections at the AC power source.</li> <li>3. Verify that the wiring connections at the AC terminal block and the power supply are complete and correct.</li> <li>4. Check that the display cable connections are secure.</li> <li>5. Check the continuity of the AC fuse located at the AC terminal block, and replace if necessary.</li> <li>6. Check the continuity of the DC fuse located on the controller module, and replace if necessary.</li> <li>7. Check the AC voltage between the black and white wires at the connection block. If the voltage is incorrect or not present, troubleshoot the external AC power source.</li> <li>8. Check the DC voltage at terminals 1 and 2 of the controller module. If the voltage is not within the range 23 to 25 V, replace the power supply.</li> <li>9. If there is still no display, replace the ribbon cable.</li> <li>10. If there is still no display, replace the display module.</li> <li>11. If there is still no display, replace the controller module.</li> <li>12. If power failure symptoms continue, contact Thermo Fisher Scientific for further instruction.</li> </ol>

**Table 5-1 Troubleshooting**

Frequent or Suspect Alarms	Frequent or Suspect Alarms	<ul style="list-style-type: none"> <li>False readings due to radio frequency interference (RFI) or electromagnetic interference (EMI).</li> </ul>	<ol style="list-style-type: none"> <li>1. Make sure that the transmitter wiring to the Safe T Net 210 is properly shielded. See the Transmitter manual.</li> <li>2. Increase the alarm delay setting using the set-up procedures described in Chapter 2, Installation and Start Up.</li> <li>3. If the alarm difficulties continue, contact Thermo Fisher Scientific for further instructions.</li> </ol>
No Audible Alarm	<p>Buzzer does not sound appropriate audible alarm.</p> <p>Audible alarm sounds weak or broken.</p>	<ul style="list-style-type: none"> <li>Calibrate mode is on.</li> <li>Buzzer is disabled.</li> <li>Buzzer is disconnected.</li> <li>Buzzer is malfunctioning.</li> <li></li> </ul>	<ol style="list-style-type: none"> <li>1. Turn off calibrate mode as described in Chapter 4, Calibration.</li> <li>2. Enable the buzzer. See the DIP switch U1 section of Chapter 2, Installation and Start Up.</li> <li>3. Check the buzzer plug-in connection on the controller circuit board.</li> <li>4. Check that the screw connections on the buzzer are secure.</li> <li>5. If the buzzer continues to fail, contact Thermo Fisher Scientific for further instruction.</li> </ol>
Incorrect Displays or Indicators	<p>Letters or numbers on the display screens are missing or distorted.</p> <p>LED indicators do not light up appropriately.</p>	<ul style="list-style-type: none"> <li>Faulty ribbon cable or connections.</li> <li>Faulty connections.</li> <li>Display module malfunction.</li> </ul>	<ol style="list-style-type: none"> <li>1. Replace the ribbon cable.</li> <li>2. Replace the display module.</li> <li>3. Contact Thermo Fisher Scientific for further instruction.</li> </ol>

## Replacing Components

This section describes the procedures for replacing components of the Safe T Net 210, including fuses, ribbon cable, display module, power supply, controller circuit board, buzzer, and RESET button.



**Figure 5-1 Internal Components**

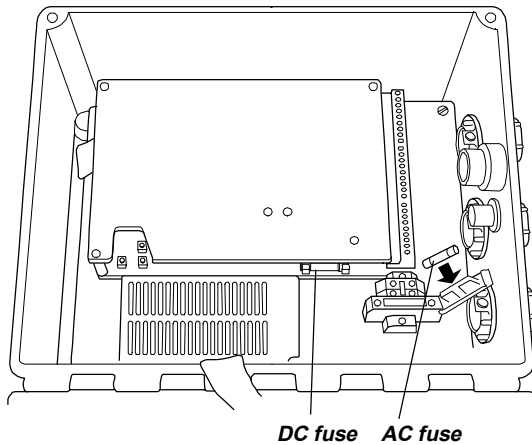
## Replacing Fuses

The Safe T Net 210 has two fuses, an AC fuse and a DC fuse.

### REPLACING THE AC FUSE

The AC fuse is located inside AC terminal block position L. To replace the AC fuse:

1. Pull back the hinged section of terminal block position L to reveal the fuse.
2. Replace with the same type (see Parts List, Appendix A), and snap the section back into place.



**Figure 5-2 AC and DC Fuse**

### REPLACING THE DC FUSE

The DC fuse is located at the edge of the controller circuit board. To replace the DC fuse:

1. Disconnect power to the Safe T Net 210 by pulling back the hinged section of AC terminal block position L.
2. Remove the six screws holding the controller module cover and remove the cover.
3. Locate the fuse on the controller circuit board and remove it from its spring clips using a screwdriver.
4. Replace the fuse with the same type (see Parts List, Appendix A).
5. Reinstall the controller module cover.
6. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.

## **Replacing the Ribbon Cable**

1. Make sure the AC power is turned off.
2. Remove the six screws holding the controller module cover and remove the cover.
3. Unplug the ribbon cable from the controller circuit board and from the display module.
4. Remove the four screws holding the mounting plate and tilt the top of the plate down and forward out of the housing. This reveals the entire ribbon cable and the clips holding it in place. Do not remove the old cable yet.
5. Observe exactly how the old cable is installed, including how the cable is folded and how the cable is fitted into the clips.
6. Hold the new cable up to the old one and fold the new cable to match the folds in the old one.
7. Remove the old cable from the clips and install the new one in its place.
8. Plug the new ribbon cable in to the display module.
9. Holding the ribbon cable connector out of the way, position the mounting plate and fasten it to the housing using the four screws at the corners.
10. Plug the new ribbon cable in to the controller circuit board.
11. Reinstall the cover on the controller module.
12. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.

## **Replacing the Display Circuit Board**

1. Make sure the AC power is turned off.
2. Unplug the ribbon cable from the display module.
3. Remove the screws holding the cover plate on the display module and remove the cover plate.
4. Remove the screws holding the display circuit board in place and remove the display circuit board.
5. Hold the new display circuit board in position against the mounting blocks and fasten it in place using the screws.
6. Reconnect the ground lead in the same position.
7. Plug the ribbon cable in to the new display circuit board.
8. Reinstall the cover plate on the display module.
9. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.

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## **Replacing the Power Supply**

1. Make sure the AC power is turned off.
2. Remove the six screws holding the controller module cover and remove the cover.
3. Unplug the ribbon cable from the controller circuit board.
4. Remove the four screws holding the mounting plate and tilt the top of the plate down and forward out of the housing.
5. From the back of the mounting plate, remove the two screws holding the power supply and remove the power supply.
6. Disconnect the AC and DC wires from the old power supply.
7. Connect the AC leads from the AC terminal block to the terminal strip of the new power supply as follows:
  - Find the black lead that is connected to the L terminal of the AC terminal block and connect the free end to power supply terminal L.
  - Find the white lead that is connected to the N terminal of the AC terminal block and connect the free end to power supply terminal N.
  - Find the green lead that is connected to the large ground terminal on the mounting plate and connect the free end to the unlabeled terminal of the power supply.
8. Connect the DC leads to the terminal strip of the new power supply as follows:
  - Find the red positive (+) DC lead that is connected to controller terminal 1 and connect the free end to power supply terminal +V.
  - Find the black negative (–) DC lead that is connected to controller terminal 2 and connect the free end to power supply terminal O.
  - Find the orange DC ground lead that is connected to controller terminal 3 and connect the free end to power supply terminal FG.
9. Hold the replacement power supply in position against the front of the mounting plate and fasten it in place using the two screws through the back of the mounting plate.
10. Position the mounting plate and fasten it to the housing using the four screws at the corners.
11. Plug the ribbon cable into the controller circuit board.
12. Reinstall the cover on the controller module.
13. Restart the SafeT Net 210 according to the instructions in the Start Up section of Chapter 2.

## **Replacing the Controller Circuit Board**

1. Make sure the AC power is turned off.
2. Unplug the three removable connectors from the controller module terminal strip.
3. Remove the six screws holding the controller module cover and remove the cover.
4. Record the position of the 24 DIP switches on the old controller module to simplify setting the switches on the replacement module. The ON position is away from the edge of the board, OFF is toward the edge of the board.
5. Unplug the ribbon cable and the buzzer from the controller circuit board.
6. Remove the four standoffs holding the controller circuit board in place and lift the circuit board out of the housing.
7. Set the DIP switches on the replacement controller module to match the settings on the old controller module.
8. Hold the replacement controller circuit board in position against the mounting plate and fasten it in place using the four standoffs.
9. Plug the ribbon cable and the buzzer in to the new controller circuit board.
10. Install the cover.
11. Plug the three connectors in to the new controller module terminal strip. The connectors are keyed to preserve the proper order: Number 1 at the left, number 27 at the right.
12. Prepare the new controller module for your application according to the instructions in the Programming and Start Up sections of Chapter 2.
13. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.

**Replacing the External Buzzer**

1. Make sure the AC power is turned off.
2. Remove the two screws connecting the buzzer wires to the buzzer. If necessary, loosen the plastic nut holding the external buzzer in the housing and turn the buzzer for access to each screw.
3. Unscrew the plastic nut and pull the buzzer out through the hole.
4. Insert the replacement buzzer in through the hole. Screw the plastic nut onto the threads of the buzzer but do not tighten it yet.
5. Connect the buzzer wires to the new buzzer using the two screws. Connect the red wire to the positive (+) terminal of the buzzer, connect the black wire to the negative (-) terminal of the buzzer.
6. Tighten the nut against the housing, securing the buzzer in place.
7. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.

**Replacing the RESET Button**

1. Make sure the AC power is turned off.
2. Remove the two screws connecting the buzzer wires to the RESET button. If necessary, loosen the nut holding the button in the housing and turn the button for access to each screw.
3. Unscrew the nut and pull the button out through the hole.
4. Insert the replacement RESET button in through the hole. Screw the nut onto the threads of the button but do not tighten it yet.
5. Connect the wires to the new button using the two screws.
6. Tighten the nut against the housing, securing the button in place.
7. Restart the Safe T Net 210 according to the instructions in the Start Up section of Chapter 2.




Appendix  
A

## PARTS LIST

**Table A-1     Safe T Net 210 Parts List**

<b>Part No.</b>	<b>Description</b>
29-0018	Gas type labels, front panel (includes one label for each gas type)
43-0440	RESET switch
43-4140	DC fuse, 3AG-1, 250 Volts, 1 Amp
43-4232	AC fuse, SO-BLO, 250 Volts, 1 Amp (230V system)
43-4234	AC fuse, GMA2, 250 Volts, 2 Amp (115V system)
47-0003	Ribbon cable
47-1011	AC line cord, 3-conductor, with reducer and cord grip
49-0073	Power supply, 24 VDC 15W out, 115-230 VAC in
52-1016	External buzzer
57-0014-02	Display circuit board
57-0015-02	Controller circuit board
71-0012	Operator's Manual, Safe T Net 210
73-0003	Safe T Net 210 two-channel wall-mounted controller, 115 VAC
73-0006	Safe T Net 210 two-channel wall-mounted controller, 230 VAC





## Appendix B

# TRANSMITTERS

Each transmitter includes an manual describing the 4 to 20 mA analog gas transmitters you ordered with your Safe T Net 210 gas monitoring controller. A transmitter comes with the following:

- The transmitter assembly, including:
  - Amplifier
  - Housing
  - Detector
- Transmitter Operator's Manual

Various 4 to 20 mA analog gas transmitters are available from Thermo Fisher Scientific for diffusion or sample-draw applications for most gases. Diffusion transmitter part numbers have the 67- prefix and sample-draw transmitter part numbers have the 68- prefix. Tables B-1 thru B-4 lists the transmitters offered for the Safe T Net 210.

**Table B-1 Standard Transmitters for Safe T Net Controllers**

Gas Type	Part Number	Manual Insert P/N	Gas Transmitter	Detection Range
Ammonia (NH <sub>3</sub> )	67-0027-09	71-0090	Diffusion type	0 to 100 ppm
	68-0020-09	71-0114	Sample draw	
Arsine (AsH <sub>3</sub> )	67-0027-13	71-0090	Diffusion type	0 to 1 ppm
	68-0020-13	71-0114	Sample draw	
Carbon monoxide (CO)	67-0027-01	71-0090	Diffusion type	0 to 500 ppm
	68-0020-01	71-0114	Sample draw	
Chlorine (Cl <sub>2</sub> )	67-0027-04	71-0090	Diffusion type	0 to 10 ppm
	68-0020-04	71-0114	Sample draw	
Chlorine dioxide (ClO <sub>2</sub> )	67-0027-16	71-0090	Diffusion type	0 to 2 ppm
	68-0020-16	71-0114	Sample draw	
Combustible (LEL)	67-0007	71-0024	Diffusion type	0 to 100% LEL
	68-0005	71-0025	Sample draw	
Diborane (B <sub>2</sub> H <sub>6</sub> )	67-0027-18	71-0090	Diffusion type	0 to 1 ppm
	68-0020-18	71-0114	Sample draw	
Fluorine (F <sub>2</sub> )	67-0027-07	71-0090	Diffusion type	0 to 10 ppm
	68-0020-07	71-0114	Sample draw	
Hydrogen chloride (HCl)	67-0027-05	71-0090	Diffusion type	0 to 30 ppm
	68-0020-05	71-0114	Sample draw	
Hydrogen cyanide (HCN)	67-0027-08	71-0090	Diffusion type	0 to 50 ppm
	68-0020-08	71-0114	Sample draw	

**Table B-1 Standard Transmitters for Safe T Net Controllers (Continued)**

<b>Gas Type</b>	<b>Part Number</b>	<b>Manual Insert P/N</b>	<b>Gas Transmitter</b>	<b>Detection Range</b>
Hydrogen fluoride (HF)	67-0027-06	71-0090	Diffusion type	0 to 10 ppm
	68-0020-06	71-0114	Sample draw	
Hydrogen sulfide (H <sub>2</sub> S)	67-0027-02	71-0090	Diffusion type	0 to 100 ppm
	68-0020-02	71-0114	Sample draw	
Nitric oxide (NO)	67-0027-14	71-0090	Diffusion type	0 to 100 ppm
	68-0020-14	71-0114	Sample draw	
Nitrogen dioxide (NO <sub>2</sub> )	67-0027-15	71-0090	Diffusion type	0 to 20 ppm
	68-0020-15	71-0114	Sample draw	
Oxygen (O <sub>2</sub> )	67-0027-03	71-0090	Diffusion type	0 to 30% VOL
	68-0020-03	71-0114	Sample draw	
Ozone (O <sub>3</sub> )	67-0027-12	71-0090	Diffusion type	0 to 1 ppm
	68-0020-12	71-0114	Sample draw	
Phosphine (PH <sub>3</sub> )	67-0027-10	71-0090	Diffusion type	0 to 1 ppm
	68-0020-10	71-0114	Sample draw	
Silane (SiH <sub>4</sub> )	67-0027-11	71-0090	Diffusion type	0 to 20 ppm
	68-0020-11	71-0114	Sample draw	
Sulfur dioxide (SO <sub>2</sub> )	67-0027-17	71-0090	Diffusion type	0 to 20 ppm
	68-0020-17	71-0114	Sample draw	

**Table B-2 FX-SMT Transmitters for Safe T Net Controllers**

Gas Type	Part Number	Manual Insert P/N	Gas Transmitter	Detection Range
Ammonia (NH <sub>3</sub> )	67-0024-09	71-0085	Diffusion type	0 to 100 ppm
Arsine (AsH <sub>3</sub> )	67-0024-13	71-0085	Diffusion type	0 to 1 ppm
Carbon monoxide (CO)	67-0024-01	71-0085	Diffusion type	0 to 500 ppm
Chlorine (Cl <sub>2</sub> )	67-0024-04	71-0085	Diffusion type	0 to 10 ppm
Chlorine dioxide (ClO <sub>2</sub> )	67-0024-16	71-0085	Diffusion type	0 to 2 ppm
Combustible (LEL)	67-0021-01	71-0085	Diffusion type	0-100% LEL
Diborane (B <sub>2</sub> H <sub>6</sub> )	67-0024-18	71-0085	Diffusion type	0 to 1 ppm
Fluorine (F <sub>2</sub> )	67-0024-07	71-0085	Diffusion type	0 to 10 ppm
Hydrogen chloride (HCl)	67-0024-05	71-0085	Diffusion type	0 to 30 ppm
Hydrogen cyanide (HCN)	67-0024-08	71-0085	Diffusion type	0 to 50 ppm
Hydrogen fluoride (HF)	67-0024-06	71-0085	Diffusion type	0 to 10 ppm
Hydrogen sulfide (H <sub>2</sub> S)	67-0024-02	71-0085	Diffusion type	0 to 100 ppm
Nitric oxide (NO)	67-0024-14	71-0085	Diffusion type	0 to 100 ppm
Nitrogen dioxide (NO <sub>2</sub> )	67-0024-15	71-0085	Diffusion type	0 to 20 ppm
Oxygen (O <sub>2</sub> )	67-0024-03	71-0085	Diffusion type	0 to 30% VOL
Ozone (O <sub>3</sub> )	67-0024-12	71-0085	Diffusion type	0 to 1 ppm
Phosphine (PH <sub>3</sub> )	67-0024-10	71-0085	Diffusion type	0 to 1 ppm
Silane (SiH <sub>4</sub> )	67-0024-11	71-0085	Diffusion type	0 to 20 ppm
Sulfur dioxide (SO <sub>2</sub> )	67-0024-17	71-0085	Diffusion type	0 to 20 ppm

**Table B-3 FX-SMTn Transmitters for Safe T Net Controllers**

<b>Gas Type</b>	<b>Part Number</b>	<b>Manual Insert P/N</b>	<b>Gas Transmitter</b>	<b>Detection Range</b>
Ammonia (NH <sub>3</sub> )	67-0025-09	71-0085	Diffusion type	0 to 100 ppm
Arsine (AsH <sub>3</sub> )	67-0025-13	71-0085	Diffusion type	0 to 1 ppm
Carbon monoxide (CO)	67-0025-01	71-0085	Diffusion type	0 to 500 ppm
Chlorine (Cl <sub>2</sub> )	67-0025-04	71-0085	Diffusion type	0 to 10 ppm
Chlorine dioxide (ClO <sub>2</sub> )	67-0025-16	71-0085	Diffusion type	0 to 2 ppm
Diborane (B <sub>2</sub> H <sub>6</sub> )	67-0025-18	71-0085	Diffusion type	0 to 1 ppm
Fluorine (F <sub>2</sub> )	67-0025-07	71-0085	Diffusion type	0 to 10 ppm
Hydrogen chloride (HCl)	67-0025-05	71-0085	Diffusion type	0 to 30 ppm
Hydrogen cyanide (HCN)	67-0025-08	71-0085	Diffusion type	0 to 50 ppm
Hydrogen fluoride (HF)	67-0025-06	71-0085	Diffusion type	0 to 10 ppm
Hydrogen sulfide (H <sub>2</sub> S)	67-0025-02	71-0085	Diffusion type	0 to 100 ppm
Nitric oxide (NO)	67-0025-14	71-0085	Diffusion type	0 to 100 ppm
Nitrogen dioxide (NO <sub>2</sub> )	67-0025-15	71-0085	Diffusion type	0 to 20 ppm
Oxygen (O <sub>2</sub> )	67-0025-03	71-0085	Diffusion type	0 to 30% VOL
Ozone (O <sub>3</sub> )	67-0025-12	71-0085	Diffusion type	0 to 1 ppm
Phosphine (PH <sub>3</sub> )	67-0025-10	71-0085	Diffusion type	0 to 1 ppm
Silane (SiH <sub>4</sub> )	67-0025-11	71-0085	Diffusion type	0 to 20 ppm
Sulfur dioxide (SO <sub>2</sub> )	67-0025-17	71-0085	Diffusion type	0 to 20 ppm

**Table B-4    FX-IR Transmitters for Safe T Net Controllers**

Gas Type	Part Number	Manual Insert P/N	Gas Transmitter	Detection Range
Methane	67-0022-01	71-0084	Diffusion type	0-100% LEL
Propane	67-0022-02	71-0084	Diffusion type	0-100% LEL
Hexane	67-0022-03	71-0084	Diffusion type	0-100% LEL